EVENT REALIZATION AND DEFAULT ASPECT

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ABSTRACT – There are languages – e.g., German, Inuktitut, and Russian – in which the aspectual reference of clauses depends on the telicity of their event predicates. We argue that in such languages, clauses or verb phrases not overtly marked for viewpoint aspect implicate or entail 'event realization', a property akin to Parsons's (1990) 'culmination'. The aspectual reference associated with the use of clauses not overtly marked for aspect is computed in accordance with the dependence of realization conditions on telicity and in line with principles of Gricean pragmatics. We formalize event realization and capture the telicity-dependent patterns of aspectual reference on which it is based by combining Krifka's (1989, 1992, 1998) event lattices with a model-theoretic interpretation of Klein's (1994) theory of tense and aspect. The latter permits us to treat the 'topic times' of aspectual operators as temporal constraints on event realization.

1. INTRODUCTION

The relationship between telicity,[1] 'viewpoint aspect' (in particular, the perfective-imperfective distinction; cf. Smith 1991),[2] and what we call 'event realization' in this article has been known to semanticists implicitly at least since Garey (1957), Kenny (1963), and Vendler (1957), in the sense that it lies at the heart of the inference patterns known as the 'Imperfective Paradox', as shown in Dowty's (1979, p. 133) expository examples, based on Vendler (1957):

(1) a. John was drawing a circle.

b. John drew a circle.

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[1] Telicity is often characterized in terms of a 'set terminal point' (Vendler 1957), some final part of events that must be realized for a telic predicate to apply to them. Events that instantiate atelic predicates lack such a set terminal point. This is actually a semantic reconstruction of the *energeia-kinesis* distinction of Aristotle's *Metaphysics* Θ 6. The term 'telicity' was apparently introduced by Garey (1957). In §3, we assume a definition of telicity in terms of quantizedness.

[2] An alternative term is 'grammatical aspect', in contrast to 'lexical aspect' or 'aktionsart', which covers telicity, but also other properties, like dynamicity and durativity (see Smith 1991). Viewpoint aspect is often characterized in terms of the metaphor of internal (imperfective) vs. external (perfective) perspective on an event (e.g., Comrie 1976). In discourse, these perspectives can be understood as 'reference points' (after Reichenbach 1947), i.e., events or time intervals that overlap with the event (internal view) or are ordered sequentially with respect to it (external view). This explains the impact of viewpoint aspect on 'temporal anaphora' phenomena in discourse, which has attracted much attention, especially in Discourse Representation Theory (e.g., Hinrichs 1986, Kamp and Rohrer 1983, Partee 1984). Alternative approaches to aspectuality characterize lexical aspect in terms of ontological classifications of eventualities and grammatical aspect in terms of operators over the ontological properties (e.g., Bach 1986; Dowty 1986; Moens 1987).

(2) a. John was pushing a cart.

b. John pushed a cart.

(1a) does not entail that a complete event that could be described by *draw a circle* did in fact occur – in our terms, the telic predicate encoded by *draw a circle* does not have event realization under imperfective aspect . Consequently, (1a) does not entail the perfective (1b); in fact, the propositions encoded by these two sentences are incompatible – they cannot both be true of the same individuals (in particular the same circle.) within the same time frame. In contrast, the atelic *push a cart* is compatible with realization in the imperfective and licenses the inference to (2b).[3] The behavior of a predicate regarding the Imperfective Paradox patterns is actually the most reliable criterion crosslinguistically for distinguishing telic and atelic predicates; additional criteria include compatibility with duration (*for*-type) vs. time frame (*in*-type) adverbials, as in *John drew a circle in /*for 5 seconds* vs. *John pushed a cart for /*in 5 seconds* (cf. Dowty (1979 p. 60) for an overview of this and other tests).

This article picks up from the observation that there are languages – e.g., German, Inuktitut (an Inuit language of arctic Quebec), and Russian – in which the aspectual reference of clauses or verb phrases (henceforth for short: clauses) depends on the telicity of the event predicates they encode. In

such languages, clauses not overtly marked for viewpoint aspect implicate or entail 'event realization', informally, the factual occurrence of an event as described by a certain predicate at a certain time. The aspectual reference associated with the use of a clause is computed in accordance with this and with principles of Gricean pragmatics. Telic predicates only entail realization under perfective aspect, and clauses encoding them are thus interpreted perfectively in the default case. Atelic predicates are compatible with realization under both imperfective and perfective aspect, but since imperfective and perfective form an entailment scale with respect to realization, clauses that encode atelic predicates and are not marked for perfective aspect are interpreted imperfectively. Effectively, the correlation in (3) emerges:

(3) *Preferred correlation between telicity and viewpoint selection*

Event predicate		Viewpoint
Telic	~	Perfective
Atelic	~	Imperfective

We propose an analysis of the Imperfective Paradox in an event-based semantics, namely Krifka's (1989, 1992, 1998) 'mereological' (lattice-theoretic) semantics of event predicates, which has the advantage over

[3] We argue in §3.3 that expressions like *push a cart* may be exceptional in entailing realization in the imperfective; most atelic predicates seem merely indeterminate in this regard.

interval-semantic treatments (such as Bennett and Partee 1978; Dowty 1979; Taylor 1977) of accounting in a plausible fashion for a larger set of details. The core of our analysis is the property of event realization, which we model as an advancement of Parsons's (1990) 'culmination'. We argue that event realization is the basis on which aspectual reference is assigned to clauses not overtly marked for aspect in languages with telicity-dependent aspectual reference.

We formalize event realization and capture the telicity-dependent patterns of aspectual reference on which it is based by combining Krifka's event lattices with a model-theoretic interpretation of Klein's (1994) theory of tense and aspect. The attractiveness of Klein's theory for our purposes lies in particular in its definition of viewpoint aspect vis-à-vis so-called 'topic times'. The topic time of an utterance that asserts or questions a proposition about some event is the time with respect to which the proposition is evaluated. This permits us to treat topic time as a temporal constraint on event realization: only those parts of an event the 'run times' of which are entailed by the viewpoint-aspectual properties of the proposition to be included in the topic time are realized. To show that event predicates are associated with telicity-dependent aspectual reference on the basis of event realization combined with Gricean maxims, we introduce a model-theoretic 'default aspect' operator that has the same type-theoretic

properties as the operators we use to interpret (im)perfective aspects under Klein's theory, but is defined only in terms of event realization.

In §2, we introduce the phenomenon of telicity-dependent aspectual reference, with data from Inuktitut, German, and Russian. We also briefly compare this phenomenon to different forms of zero-marked aspectual reference in other languages. We then propose model-theoretic analyses of the property of event realization and the default aspect operator based on Klein and Krifka in §3. We show that the operator indeed has a perfective interpretation with telic predicates and an imperfective one with atelic predicates, and we discuss how the operator accounts for the phenomena at hand. In §4, we briefly review evidence from child language indicating that aspectual interpretation on the basis of event realization is the preferred form of aspectual reference in the early stages of child language development crosslinguistically. This suggests that event realization has a powerful impact on language use from an early age.

2. TELICITY-DEPENDENT ASPECTUAL REFERENCE

By telicity-dependent aspectual reference, we mean the phenomenon that clauses or verbal projections not overtly marked for viewpoint aspect are assigned semantic viewpoint-aspectual operators on the basis of the telicity

of their event predicates.[4] An ideal system of telicity-dependent viewpoint aspect has the structure depicted in Table 1:

Predicate / Viewpoint	atelic	telic
imperfective	∅	overtly expressed
perfective	overtly expressed	∅

Table 1. *An ideal telicity-dependent aspect system*

Here, ∅ stands for a viewpoint aspect operator that has no overt expression. Our goal in this article is to show that in telicity-dependent systems, clauses that lack overt viewpoint operators are assigned aspectual reference on the basis of an implicature or entailment of 'event realization'. In this section, we discuss three languages that exhibit some form of telicity-dependent aspectual reference – Inuktitut, German, and Russian. We then compare these systems to one in which aspect marking depends on the classification of event predicates in terms of processes vs. state changes, found in Yukatek

[4] We assume that verbs, verbal projections, and clauses encode the natural-language counterparts of model-theoretic event predicates – predicates denoting properties of events – in the sense of e.g., Davidson (1967), Krifka (1989, 1992, 1998), Parsons (1990). The event predicates encoded by verbal projections and clauses are composed out of the event predicates lexicalized by verbs and certain adjuncts and the predicates over individuals encoded by arguments and other adjuncts through operations that are modelled by lambda abstraction and function application. Lexical-aspectual properties such as telicity and dynamicity are properties of event predicates. Viewpoint aspects are operators that denote ordering relations between the 'run times' of events and certain other time intervals – in the treatment developed in §3, 'topic times' – which serve as 'viewpoints', or 'reference points', in the sense of Reichenbach (1947). For the sake of simplicity, we assume that every clause contains exactly one viewpoint operator. Whether viewpoint operators are crosslinguistically encoded by a particular syntactic projection – some kind of 'aspect phrase' – is a matter we remain uncommitted on.

Maya. We also briefly contrast telicity-dependent viewpoint aspect with dynamicity-governed systems, as found in English.

Inuktitut, a language spoken by the Inuit of arctic Quebec,[5] has a single temporally zero-marked verb form that occurs with both telic and atelic predicates, but its interpretation differs depending on the telicity of the predicate. Temporally zero-marked constructions encoding telic event predicates have a perfective interpretation, as in (4), and those encoding atelic predicates have an imperfective interpretation, as in (5) (Swift forthcoming). [6]

(4)	*Anijuq.*
INU	ani-juq
	go.out-PAR.3.SG
	'He/she went out.'

(5)	*Pisuttuq.*
	pisuk-juq
	walk-PAR.3.SG
	'He/she is walking.'

This zero-marked form is contrasted with marked forms that encode perfective viewpoints in clauses with atelic predicates and imperfective viewpoints in clauses with telic predicates. Overt markers must be used to

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5 The examples here are from the Tarramiut (Hudson Strait) dialect of Inuktitut.

6 The following abbreviations are used in the interlinear glosses: 1 – First person; 3 – Third person; A – 'Set-A' (ergative/possessor) cross-reference marker; AUX – Auxiliary; B – 'Set-B' (absolutive) cross-reference markers; CMP – Completive; IMPF – Imperfective; INC – Incompletive; ING – Ingressive; NPRES – Non-present tense; PAR – Participial (the standard indicative mood in Tarramiut); PAST – Past tense; PRS – Present tense; PRV – Perfective; SG – Singular; TEL – Telic (prefix); TERM – Terminative; TP – Terminal particle.

express aspectual viewpoints other than those available with the zero-marked forms in (4) and (5), such as imperfective viewpoints with telic predicates as in (6) and perfective viewpoints with atelic predicates as in (7).

(6)	*Ani**lir**tuq.*	(7)	*Pinasu**giir**tuq.*
INU	ani-**liq**-juq		pinasuk-**jariiq**-juq
	go.out-ING-PAR.3.SG		work-TERM-PAR.3.SG
	'He/she is (in the process of)		'He/she finished
	going out.'		working.'

We now turn to a language that lacks overt aspect marking altogether, namely (Standard) German.[7] German atelic descriptions in the present or past tense are preferentially interpreted imperfectively, while telic descriptions in the same tenses are preferentially interpreted perfectively (cf. Bohnemeyer 1998).

(8) a. Als wir in Nijmegen eintrafen, regnete es.
GER when we in Nijmegen arrived(PAST) it rained(PAST)
'When we arrived in Nijmegen, it was raining.'

b. Als wir in Nijmegen eintrafen,
when we in Nijmegen arrived(PAST)

regnete es eine Stunde lang.

it rained(PAST) for an hour

'When we arrived in Nijmegen, it rained for an hour.'

(9) a. Als ich Marys Büro betrat,

GER when I Mary's office entered(PAST)

schrieb sie an einem Brief.

wrote(PAST) she at a letter

'When I entered Mary's office, she was writing a letter.'

b. Als ich Marys Büro betrat,

when I Mary's office entered(PAST)

schrieb sie einen Brief.

wrote(PAST) she a letter

'When I entered Mary's office, she wrote a letter.'

Example (8b) differs from (8a) in the added duration adverbial *eine Stunde lang* 'for an hour', which renders the event description telic.[8] The only

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[7] Colloquial dialects show a variety of weakly grammaticalized progressive periphrases; cf. e.g., Ballweg (1981); Delisle (1986).

[8] The adverbial *eine Stunde lang* 'for an hour' renders the event predicate 'bounded' in the sense of Depraetere (1995). Since bounded predicates are quantized, they satisfy the definition of telicity we give in §3. We use this explicit form (a) for the sake of the minimal contrast to the atelic predicate encoded without the adverbial and (b) to have unambiguous telicity.

natural interpretation of (8a) is that the rain is unbounded vis-à-vis the arrival in Nijmegen, i.e., the description of the rain event is semantically imperfective. In contrast, while such an interpretation is still possible in (8b), by far the most natural reading of this sentence is that the rain started at the arrival in Nijmegen, i.e., the rain is referred to perfectively. Similarly, (9a) differs from (9b) in the partitive construction *an einem Brief* which entails that only an unspecified part of the letter was written, rendering the description atelic (cf. Krifka 1992). Example (9a) cannot be understood any other way than that the writing event was ongoing during the entering event, so in semantic terms, it is presented imperfectively. In contrast, (9b) suggests that the writing event's onset coincided with the entering (at least this reading is more plausible than the overlap reading); i.e., the description of the writing event is interpreted perfectively.

However, while a certain tradition of German studies may be construed as arguing that clauses with atelic predicates actually encode imperfectivity, and those with telic predicates encode perfectivity (see e.g., Eisenberg 1986, Engel 1988; Ehrich 1992; Leiss 1992), the correlation can in fact be shown to be no more than an implicature.[9] For example, perfectivity in (9b) can easily be blocked or cancelled in an appropriate context:

[9] See Bohnemeyer (1998) for an analysis of a small German corpus elicited under controlled conditions, showing a significant tendency of clauses with telic predicates to occur more often

(9) b'. Als ich Marys Büro betrat,
when I Mary's office entered(PAST)
schrieb sie einen Brief.
wrote(PAST) she a letter
Überrascht blickte sie auf,
surprised looked(PAST) she up
legte den Stift zur Seite,
laid(PAST) the pen aside
und lächelte mich an.
and smiled(PAST) me at
'When I entered Mary's office, she wrote / was writing / a letter.
Surprised, she looked up, put the pen away, and smiled at me.'

In (9b'), reference to the letter writing is understood to be imperfective – the speaker's entering overlaps with the letter writing, and completion of the letter is not entailed. The analysis of telicity-dependent aspectual reference we propose in §3 in fact predicts no more than an implicated alignment between (a)telicity and (im)perfectivity. However, these implicatures may turn into entailments due to 'pragmatic strengthening' (Hopper and Traugott 1993); this appears to have happened in Inuktitut, and possibly also in the Russian case discussed below.

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with perfective interpretations and of clauses with atelic predicates to occur more frequently with

The differential aspectual interpretation of clauses with telic and atelic predicates in German has some interesting "side effects" that deserve further attention. Firstly, as pointed out independently by Ehrich (1992) and Leiss (1992), the so-called present tense of German tends to have present time reference with atelic predicates, as in (10), but future time reference with telic predicates, as in (11) (in contexts where it is understood as reference to individual events rather than habitual or generic reference).

(10) Es schneit.
GER it snows(PRS)
'It is snowing.'

(11) Der Zug fährt ab.
GER the train leaves(PRS)
'The train is leaving / going to leave / will leave.'

Example (11) has not only pre-state readings (e.g., an announcement at the station, warning passengers and bystanders that the train is about to leave), but also purely predictive readings (e.g., 'The train will leave (at such-and-such time known to us)'). In contrast, the most likely interpretation for example (10) is that snow is falling at the time of utterance. This is easily

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imperfective interpretations.

explained by the preferences of (10) for imperfective and (11) for perfective interpretations, in combination with a constraint excluding perfective viewpoints from present time reference in most contexts (see e.g., Smith 1991, pp. 110-112).

The second "side effect" of the telicity-dependent aspectual interpretation of clauses in German is the indirect impact telicity gains, via determining viewpoint-aspectual reference, on temporal anaphora phenomena in discourse. In narratives, clauses encoding telic predicates come to be associated with 'referential shift' (i.e., sequential event order), as in (8b) and (9b) above, while clauses encoding atelic predicates are associated with the maintenance of reference points, and thereby with overlap, as in (8a) and (9a). This is highly reminiscent of the treatment of temporal anaphora in English in Dowty (1986), Hinrichs (1986), and ter Meulen (1995) – all of these describe temporal anaphora as governed by the distinction between Vendlerian states and activities on the one side and accomplishments and achievements on the other, i.e., effectively, by telicity. In our view, this analysis is better suited to the facts of Dutch and German than to those of English.[10] We think that temporal anaphora phenomena are universally governed by viewpoint aspect, as suggested by Kamp and Rohrer (1983) for

[10] The Dutch phenomena are somewhat similar to the German ones., though not completely Unlike Standard German, Dutch has a grammaticalized progressive construction. However, unlike in English, the use of the progressive is not obligatory with imperfective viewpoints in Dutch (cf. Boogaart 1999). On the impact of the availability of a progressive construction on the interpretation of aspectually unmarked clauses, see below.

French, Bohnemeyer (1998) for German and Yukatek Maya, and Boogaart (1999) for Dutch. The impact of telicity on temporal anaphora in Dutch and German is an artifact of the telicity-dependence of aspectual reference in these languages. Since English has a dynamicity-governed aspect system (see below), the telicity-biased analysis of temporal anaphora makes the wrong predictions for activity verbs. These are dynamic and atelic, and thus should trigger reference point maintenance according to Hinrichs, Dowty, and ter Meulen. Thus, Dowty (1986) predicts that the second clause in (12) should maintain the reference point introduced by the first clause, due to the atelic predicate encoded by *tick*:

(12) John entered the president's office. The clock on the wall ticked loudly. (Dowty 1986: 38)

Our consultants consider (12) marked. The interpretation that the clock has been ticking before John entered seems indeed natural; but to indicate overlap, the second clause should appear in the progressive. Since it does not, it is interpreted perfectively, leaving consultants groping to coerce an interpretation in line with referential shift (e.g., a semelfactive reading of *tick*).[11]

[11] The position that activity verbs pattern with achievements and accomplishments with respect to temporal anaphora in English is implicitly shared by Kamp and Reyle (1993) and Smith (1991).

The case of Russian, Czech, and other Slavic languages is slightly more complex than that of Inuktitut and German. In Russian, unprefixed verbs such as *kolót'* 'prick', *kryt'* 'cover', *igrát'* 'play', or *pisát'* 'write' are mostly atelic. Telic predicates, on the other hand, are mostly encoded by prefixed verbs (or verbs suffixed with the 'semelfactive' suffix *–nu*).[12] This includes prefixed counterparts of the atelic unprefixed forms, such as *vý-kolot'* 'thrust out', 'tattoo'; *ot-krýt'* 'open'; *pro-igrát'* 'lose'; and *pere-pisát'* 'copy'. The relationship between telicity and prefixation is quite systematic; even unprefixed verbs that one would expect to be telic on the basis of their English glosses are in fact atelic. Consider the example of *stávit'* 'put' (and see Filip (1999) and Krifka (1992) for the following):

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[12] There are some 50 unprefixed telic verbs, such as *brósit'* 'throw', *dat'* 'give', *kónčit'* 'end', and *past'* 'fall'. These are all inherently perfective, and thus in fact correspond to our hypothesis. However, they have suppletive imperfective 'partners', and these inherently imperfective verbs are naturally difficult to test for telicity. Moreover, arguably not all prefixed verbs are telic. As Filip (1999,PP. 200-207) shows for Czech – the Russian data are parallel – there are prefix verbs which combine with duration adverbials, rather than with time span adverbials, and to this extent pattern with atelic verbs. These are in particular members of the 'cumulative' (e.g., *na-nosít' drov* 'bring a sufficient amount of wood'), 'delimitative' (e.g., *po-čitát'* 'read for a while'), and 'attenuative' (e.g., *pri-leč'* 'lie down for a bit') 'aktionsarten' (quoting Russian examples from Isačenko 1975: 381-397). Filip submits that these quantify over the event variable or an individual variable carrying an 'incremental theme' role or both. If an incremental theme is involved, quantizedness of the event predicate may depend on quantizedness of the incremental theme. Since the verbs in question are perfective, and we characterize telicity in terms of quantizedness in §3.1, this is the only case that poses a potential problem for our account. However, note that the verbs in question do seem to entail event realization; at least they lack imperfective counterparts. In any case, these predicates need further study. Finally, as for the

(13) Včera ja stavila knigi na polku dva časa.
RUS yesterday I put(PAST) books(PL) on shelf two hours
'Yesterday I put books on the shelf for two hours.'

(14) Včera ja **po-**stavila vse knigi na polku
RUS yesterday I **TEL-**put(PAST) all books(PL) on shelf
za dva chasa.
in two hours
'Yesterday I put all the books on the shelf in two hours.'

The telicity contrast in (13)-(14) is due to (13) referring to an indefinite set of books, but (14) to a definite one. Russian does not have a definite article (definiteness interpretations on noun phrases are in fact often triggered on the basis of telic verb prefixes); the delimitation of the set of books in (14) is forced by the universal quantifier *vse*. This renders the event predicate encoded by (14) quantized and thereby telic (cf. §3). The selection of time adverbials reflects the telicity contrast – *dva chasa* 'for two hours' is a duration adverbial, while *za dva chasa* 'in two hours' in (14) is a time span adverbial. Crucially, the atelic *stávit'* is acceptable in (13), but not in (14), while the telic *po-stávit'* is acceptable in (14), but not in (13).[13]

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semelfactives in *–nu* (e.g., *glot-nut'* 'swallow'), these are telic and inherently perfective and thus fit our analysis.

[13] We thank Tania Kochetkova and Mikhail Masharov for Russian examples and judgements.

Now, even though in the tradition of Russian grammaticography, unprefixed verbs such as those quoted above are called 'imperfective', semantically they allow for both imperfective and perfective interpretations, as Klein (1995) has shown.[14] (13) in fact shows a perfective use of *stávit'*. However, the prefixed verbs are strictly perfective. Thus, while the simplex *stávit'* in (15) is most likely interpreted imperfectively (in terms of the viewpoint metaphor, the putting event is viewed internally in (15); in terms of the effect on temporal ordering, the putting event is interpreted to overlap with the *when*-clause event), the prefixed *po-stávit'* in (16) does not permit this reading (the two events can only be understood to be ordered sequentially).

(15) Ja stavila knigi na polku
RUS I put(PAST) books(PL) on shelf
kogda uslyšala novosti.
when heard(PAST) news
'I was putting books on the shelf when I heard the news.'

[14] Our analysis of the Russian data closely follows Klein (1995). Note that Klein's use of the terms 'perfective' and 'imperfective' as designating semantic aspect operators (cf. §3) does not always align with how these terms are traditionally used in Slavic linguistics to denote verb form classes. Our treatment parts company with Klein's mainly in that we consider the essential contribution of the prefixes to the aspectual "mix" to be telicity, not state change.

(16) *Ja **po-**stavila vse knigi na polku
RUS I **TEL-**put(PAST) books(PL) on shelf
kogda uslyšala novosti.
when heard(PAST) news
'I was putting all the books on the shelf when I heard the news.'

The perfectivity of *po-stávit'* renders (17) pragmatically anomalous: Igor cannot have interrupted the shelving of the books (both because of the entailment of realization and because of sequential ordering); hence, it is unclear what he did interrupt.

(17) ? Ja **po-**stavila vse knigi na polku
RUS I **TEL-**put(PAST) books(PL) on shelf
kogda Igor' prerval menja.
when Igor' interrupted(PAST) me
'I had put all books on the shelf when Igor interrupted me.'
/*'I was putting all the books on the shelf when Igor interrupted me'

Many prefixed telic verbs form so-called 'secondary imperfectives' by suffixation of *-iv*/*-yv*. (18) shows the atelic *pisát'* 'write'; (19) the telic *pere-pisát'* 'copy'. (20) features the secondary imperfective *pere-písyvat'* 'be

copying'; in this context, the inherently perfective *pere-pisát'* is again anomalous.

(18) Včera ja pisala pis'ma dva časa.
RUS yesterday I wrote(PAST) letters(PL) two hours
'Yesterday I wrote letters for two hours.'

(19) Ja **pere-**pisala pis'mo za dva časa.
RUS I **TEL-**wrote(PAST) letter in two hours
'I copied the letter in two hours.'

(20) Ja **pere-**pis-**yv**ala pis'mo
RUS I **TEL-**write-**IMPF**-PAST letter
kogda Igor' prerval menja.
when Igor' interrupted(PAST) me
'I was copying the letter when Igor interrupted me.'

The picture that emerges here can be summarized as follows: verbs encoding telic predicates are zero-marked for perfective aspect; if they produce imperfective forms at all, they require the suffix *–iv*/*–yv* for this purpose. In contrast, atelic predicates without overt aspect marking are compatible with both imperfective and perfective interpretations. This is in

line with the analysis in §3, to the extent that atelic predicates may have event realization under both aspects. However, our account further predicts that imperfectivity should be a preferred interpretation with atelic predicates. Whether this indeed holds for Russian remains to be investigated.

To properly delimit the scope of our analysis, let us briefly compare telicity-dependent aspectual reference to other cases in which the viewpoint of clauses not overtly marked for aspect depends on lexical-aspectual properties. A system that at first sight looks strikingly similar to that of Inuktitut is found in Yukatek, the Mayan language of the Yucatan peninsula in Mexico and Belize. Intransitive process verbs take a zero suffix when combining with the imperfective aspect auxiliary, as in (21), but the suffix *-nah* when combining with the perfective aspect auxiliary, as in (22).

(21) **K-**u=meyah-**ø**.
YUK **IMPF-**A.3=work**(INC)**
'He works/is working.'

(22) **H=**meyah-**nah**-ih.
PRV=work-**CMP-**B.3.SG
'He worked.'

Conversely, intransitive state change verbs take the suffix *-Vl*[15] when combining with the imperfective aspect auxiliary, as in (23), and a zero suffix when combining with the perfective auxiliary, as in (24) (cf.

Bohnemeyer (2002, in press)).[16]

(23) **K-**u=kim-**il**.
YUK **IMPF-**A.3=die-**INC**
'He dies / is dying.'

(24) **H=**kim-**ø**-ih.
PRV=die**(CMP)-**B.3.SG
'He died.'

The aspect marking patterns in (21)-(24) do not directly reflect the telicity of the predicate encoded by the clause, but only the lexical classification of the verb stem in terms of the distinction between processes and state changes in the sense of von Wright (1963) and Dowty (1979) and similar proposals by Bach (1986), Klein (1994), Moens (1987) and others. The form of the aspectual suffixes a verb occurs with are determined in the lexicon and do not vary with the referential and quantificational properties of the argument noun phrases it combines with in syntactic projections. One might think of the Yukatek system as a "lexicalized" version of the telicity-governed split exhibited by languages like Inuktitut and Russian. For instance, *kim* 'die' is telic when combined with a quantized theme argument, as in (23); but when combined with a nonquantized noun phrase like *máak* 'people', it becomes atelic (see e.g., Verkuyl (1972, 1992); Krifka (1989, 1992, 1998)). Yet, either way, it is zero-marked for perfective aspect and

[15] /*V*/ represents a vocalic morphophoneme the quality of which is determined by a root vowel ('vowel harmony').

requires an overt suffix to express imperfective aspect (see Bohnemeyer 2002 for details). Table 2 summarizes the analysis of the pattern in (21)-(24):

Verb class Viewpoint	process	state change
imperfective	∅	overtly expressed
perfective	overtly expressed	∅

Table 2. *Aspect marking sensitive to verb classes*

A type of differential aspect marking that appears to occur quite frequently in the languages of the world is that exhibited by English. We illustrate this type of system with examples from the Kwa language Ewe, spoken in Ghana and Togo. Like English, Ewe contrasts a marked progressive (expressing imperfective viewpoint) with a zero-marked perfective form. In both languages, the aspectual reference of the marked form – the progressive – as well as that of the zero-marked form is independent of telicity, as shown in (25) and (26).[17]

(25) a. Kofi dze dɔ

EWE Kofi contact illness

[16] In addition, there are two other classes of intransitive state change verbs which overtly mark both aspects, and the same holds for all transitive verbs.

tsódzo ɖagbe vaseɖe kuɖagbe.

from Monday until Wednesday

'Kofi was ill from Monday till Wednesday.'

b. Ési me-yi é-gbɔ lá, é-dze dɔ.

when 1.SG-go 3.SG-place TP 3.SG-contact illness

'When I went to him, he was ill.'

(26) a. Kofí kpɔ TV etsɔ.

EWE Kofi see TV yesterday

'Kofi watched TV yesterday.'

b. Esi me-yi kɔfí gbɔ etsɔ lá

when 1.SG-go Kofi place yesterday TP

é-nɔ TV kpɔ-m´.

3.SG-AUX:NPRES TV see-PROG

'When I went to see Kofi yesterday he was watching TV.'

The examples in (25) show the stative phrase *dze dɔ* 'be ill' (literally 'be in contact with illness') with perfective viewpoint in (a) and imperfective

[17] The Ewe examples have been kindly provided by James Essegbey.

viewpoint in (b). In both cases, there is no overt aspect marking. In contrast, the dynamic *kpɔ TV* 'watch TV' in (26) is interpreted perfectively when not aspectually marked, as in (a), and requires progressive marking to achieve an imperfective interpretation, as in (b). The translations of (25) and (26) illustrate the same point for English. Since progressive marking does not depend on telicity (rather on dynamicity), neither does the aspectual interpretation of the simple tense forms. Such systems are likely found in languages that have fully grammaticalized progressives, but not imperfective aspect markers. In first approximation, progressives express imperfective viewpoints, but are restricted to dynamic clauses (cf. Dowty 1979; Taylor 1977). Dynamic clauses unmarked for viewpoint aspect then come to be associated with perfective aspect through Gricean Quantity implicatures (Grice 1975; cf. also Levinson 2000). Table 3 summarizes dynamicity-dependent aspect marking:

Predicate Viewpoint	stative	dynamic
imperfective	∅	overtly expressed
perfective	∅	∅

Table 3. *Aspect-marking sensitive to verb classes*

In contrast to the systems depicted in Table 2-3, telicity-dependent aspectual reference in clauses without overt viewpoint aspect markers presumably only arises if overt viewpoint aspect marking either depends on

telicity – as in Inuktitut and Russian – or is lacking altogether, as in German. Quite possibly the aspectual interpretation of the zero-marked clauses always starts out as an implicature, as in German; but this implicature may turn into an entailment (as appears to have happened in Inuktitut and Russian) through the process of semantic change known as 'pragmatic strengthening' (cf. Hopper and Traugott 1993). The analysis we develop in §3 predicts implicated alignments of aspectually unmarked clauses encoding telic predicates with perfective viewpoints and of unmarked clauses encoding atelic predicates with imperfective viewpoints. We submit that aspectually unmarked clauses in languages with telicity-dependent viewpoint aspect implicate event realization and are aspectually interpreted accordingly.

3. Towards a Semantic Explanation

We propose that in languages with telicity-dependent aspectual reference, such as those discussed in §2, verbal projections and clauses which are not overtly marked for viewpoint aspect implicate event realization, on the basis of Grice's (1975) second maxim of Quantity. Their aspectual reference is then computed in accordance with the conditions under which the event predicates they encode have event realization. This is perfective aspect for telic predicates, while atelic predicates are compatible with realization under both perfective and imperfective viewpoints – Grice's first Quantity maxim

here triggers a scalar implicature to imperfective.

We develop our account as follows. In §3.1, we lay out the framework of our analysis, based on Krifka's (1989, 1992, 1998) mereological approach to event semantics and telicity and Klein's (1994) account of tense and viewpoint aspect. In §3.2, we introduce the concept of event realization. We start from Parsons's (1990) related notion of 'culmination', take into account recent criticisms of Parsons's proposal , and eventually arrive at a definition which, in line with Klein's theory of aspect, constrains realization to those parts of an event the 'run times' of which fall into the 'topic times' for which a proposition about the event is evaluated.

In §3.3, we argue that event predicates are associated with telicity-dependent aspectual reference on the basis of event realization combined with Gricean maxims. We introduce a model-theoretic 'default aspect' operator that has the type-theoretic properties of viewpoint aspects under our interpretation of Klein's theory, but is defined in terms of event realization, and examine under what conditions this operator has the telicity-dependent aspectual interpretations observed in §2-§3. We do not consider default aspect a (notional) aspectual operator on a par with perfective and imperfective aspect. For one, we are unaware of any language that overtly marks default aspect. Default aspect is merely the preferred or exclusive aspectual interpretation of predicates not overtly marked for aspect in languages in which aspect marking and aspectual reference depend on event

realization. In §3.4, we review the data of §2 and discuss how default aspect accounts for them. In §4, we briefly consider the possible role of event realization in constraining aspectual reference in child language.

3.1 PREREQUISITES

With Davidson (1967), Parsons (1990), and many others, we assume that natural language predicates denote properties of events. In the spirit of Krifka (1998, p. 206), we adopt the definition of an 'event structure' E that includes a domain of events U_E and a 'time structure' T_E. E defines a mereological 'part structure' on U_E, which includes a part relation $\leq_E$ and a proper part relation $<_E$ among events. T_E defines analogous relations $\leq_T$ and $<_T$ over a domain of time intervals U_T. $\leq_E$ and $\leq_T$ are partial order relations defined via primitive mereological 'sum' operations, and E and T_E are join semilattices with respect to these sum operations. E moreover includes a 'temporal trace' function τ_E from U_E to U_T which assigns 'run(ning) times' to events. We understand these as situated time intervals the lower bounds of which are marked by the beginnings of the events and the upper bounds of which mark the ends of the events.

We follow Klein (1994) in considering viewpoint aspect operators as relating the run time $\tau_E(e)$ of an event e (corresponding to Klein's 'time of the situation') to the 'topic time' t_{TOP} of some proposition "about" e. Tense operators then relate topic times to coding times. Topic times are the times

for which propositions are, depending on the illocution of the utterance, asserted to be true, questioned for their truth, "requested" to be made true, and so on – in short, the times with respect to which propositions are evaluated. Consider (27):

(27) On Monday, Floyd was ill.

There are at least two ways in which the interval denoted by *on Monday* may constrain the topic time for which the proposition encoded by *Floyd was ill* is asserted – the proposition may hold for the entire interval, or there may be an implicit existential quantification over some subinterval for which the proposition is asserted (say 3 pm to 4 pm). Either way, the topic time does not bind the run time of the state of Floyd being ill – Floyd may well continue to be ill through Wednesday. But whatever happened prior to Monday or after Monday has no impact on the truth of (27), which is only evaluated for this particular topic time.

Because topic times delimit the evaluation of propositions, we argue below that they constrain event realization. Of particular interest for the present purposes are perfective aspects, which encode inclusion of $\tau(e)$ in t_{TOP} and thus entail realization of the entire event (as in our formalization in (28), where P is an event predicate), and imperfective aspects, which encode proper inclusion of t_{TOP} in $\tau(e)$ and thus entail realization of proper

subevents at most ((29); see Figure 1 in §3.2):[18]

(28) PRV := $\lambda P \lambda t_{TOP} \exists e[P(e) \wedge \tau(e) \leq_T t_{TOP}]$

(29) IMPF := $\lambda P \lambda t_{TOP} \exists e[P(e) \wedge t_{TOP} <_T \tau(e)]$

The binding of t_{TOP} by a lambda operator in (28)-(29) reflects Klein's (1994 p. 108) view that aspectual operators constrain 'projection ranges' of possible topic times rather than operating on definite topic times; it is really these projection ranges that are assigned to t_{TOP} in (29). From these projection ranges, some definite topic time may then be selected in context. In this regard, topic times play a similar role in Klein's theory to that of Reichenbachian 'reference points' (Reichenbach 1947) in treatments of tense and aspect in Discourse Representation Theory, such as Hinrichs (1986), Kamp and Rohrer (1983), and Partee (1984). That is, every proposition in discourse is evaluated with respect to its own unique (set of) topic time(s), but contextual inferences may determine the topic time of one proposition to be identical to or 'shifted' with respect to that of some

[18] Precedence relations between $\tau(e)$ and t_{TOP} yield prospective (as in English *be going to* + infinitive constructions, where t_{TOP} precedes $\tau(e)$) and perfect aspects (as in the English perfect tenses, where t_{TOP} follows $\tau(e)$). For the relation between event realization implicatures and such aspectual interpretations see §3.3. Partial overlap of $\tau(e)$ and t_{TOP} is discussed but not properly accounted for in Klein (1994), and is disregarded here as well.

proposition in surrounding discourse.[19]

Now consider some examples:[20]

(30) Am Nachmittag schrieb Hans einen Brief.
in the afternoon wrote(PAST) Hans a letter
'In the afternoon, Hans wrote a letter.'

(31) Am Nachmittag schrieb Hans an einem Brief.
in the afternoon wrote(PAST) Hans at a letter
'In the afternoon, Hans was writing a letter (lit.: wrote part of a letter).'

The topic times for the evaluation of (30)-(31) are delimited by the adverbial *am Nachmittag* 'in the afternoon'. The semantically perfective (30) entails that the time of letter writing is included in this time, and thus that the letter was completed in the afternoon. In (31), the partitive *an einem Brief* 'at a letter' restricts realization within the afternoon frame to part of a letter. Since the writing of some part of a letter equals a partial writing of the letter, this has the effect of locating the topic time frame within the run time of the hypothetical writing of the complete letter, which explains why

[19] In "tensed" languages, the ranges of possible topic times are further constrained by tense operators, which on Klein's view relate topic times to coding time, or the 'time of utterance'.

[20] We thank an anonymous reviewer for suggesting (30)-(31).

the truth conditions of (31) are rather like those of the imperfective *In the afternoon, Hans was writing a letter*.

As for (a)telicity, in line with Krifka's approach, we view these not as properties of events, but as properties of event predicates. The closest mereological second-order properties that may be used to capture the properties of telic and atelic predicates are quantizedness and cumulativity, respectively. In (32), we define all telic event predicates as quantized and *vice versa*, based on Krifka's (1992 p. 32; 1998 p. 200) characterization of quantized predicates.

(32) $\forall P \subseteq U_E [\mathrm{TEL}_E(P) \leftrightarrow \forall e,e' \in U_E[P(e) \wedge P(e') \rightarrow \neg e' <_E e]]$

According to (32), an event predicate *P* is telic if an event *e'* that instantiates *P* cannot be a proper part of another event *e* that also falls under *P*.[21]

[21] Krifka (1992, 1998) cautions that while clearly all quantized event predicates are telic, there may be non-quantized telic predicates as well. Krifka (1992, p. 36) mentions the predicate encoded by *walk to the station* – would this not be instantiated by any number of "subwalks" that all terminate at the station? However, on closer examination, this is not so obvious. Consider *Loretta walked to the station*. There are various ways in which this sentence may be used in natural interactions. For example, with the main stress on *walk*, it may simply answer a question about how Loretta got to the station. But it seems that in any context in which one might try to test the sentence for telicity – be it via the Imperfective Paradox, compatibility with duration vs. time span adverbials, etc. – one has to compute the truth conditions of *walk to the station'* with respect to some implicit starting point that is to be retrieved from context. In this case, the truth conditions of *Loretta walked to the station* are equivalent to those of something like *Loretta walked from where she was before to the station*, which of course encodes a quantized predicate. In short, we feel justified in considering quantizedness at least a reasonable enough approximation of telicity to restrict our discussion to it.

The case for cumulativity – the property of event predicates to apply to the mereological sum of any two subevents it applies to – as a necessary and sufficient condition for atelicity is a different story. Cumulativity is for various reasons rather impracticable for our goals. For one, in order to calculate the conditions atelicity imposes on event realization, we need to talk about the subevents of events in the denotation of atelic predicates – and not about their sums. So in a first approximation, we define atelicity in (33) as divisiveness, i.e., by requiring that events falling under atelic predicates have at least one proper part that falls under the same predicate:

(33) $\forall P \subseteq U_E[\mathrm{ATEL}_E(P) \leftrightarrow \forall e \in U_E\,[P(e) \rightarrow \exists e' \in U_E[P(e') \wedge e' <_E e]]]$

But divisiveness is still too broad: it sweeps under the rug important differences distinct types of atelic predicates show regarding event realization.[22] In order to get at these differences, we consider a continuum of cases ranging from completely divisive and homogenous predicates to those that only have atomic events in their extension. This latter case is telic, while all other predicates on the continuum are atelic.

Predicates that are 'homogeneously divisive' are those that have the 'subinterval property' in the sense of Taylor (1977) and Dowty (1979), i.e.,

[22] It should not come as a surprise to find the class of atelic predicates rather heterogeneous. After all, atelicity is essentially a negative property. This is the very reason why we are struggling here to find some positive characterization.

all subevents of events in the extension of the predicate also fall under the predicate:

(34) $\forall P \subseteq U_E[\mathrm{HOMD}_E(P) \leftrightarrow \forall e \in U_E[P(e) \rightarrow \forall e' \in U_E[e' \leq_E e \rightarrow P(e')]]]$

Perhaps Vendler (1957) chose his paradigm activity example *push a cart* with something like homogenous divisiveness in mind.[23] In the case of *push a cart*, there are at least no obvious candidates for atomic pushing events; but with probably the great majority of natural language event predicates, this is certainly different. The notion of 'atoms', the smallest parts that instantiate the predicate, and that of 'atomic predicates' may be defined as in (35)-(36), respectively, following Krifka (1992, p. 32):

(35) $\forall P \subseteq U_E, \forall e \in U_E[\mathrm{ATOM}_E(e,P) \leftrightarrow P(e) \wedge \neg \exists e' \in U_E[P(e') \wedge e' <_E e]]$

(36) $\forall P \subseteq U_E[\mathrm{ATM}_E(P) \rightarrow$

$\forall e \subseteq U_E[P(e) \rightarrow \exists e' \in U_E[e' \leq_E e \wedge \mathrm{ATOM}_E(e',P)]]]$

That is, an event *e* is a *P*-atom iff it falls under *P* and does not contain any subevent that also falls under *P*. And a predicate *P* is atomic iff every event *e* that falls under *P* has a *P*-atom as a part. A clear enough example of an

[23] Except as a characterization of activities such as denoted by *push a cart*, Vendler would restrict (34) to non-instantaneous subevents.

atomic predicate is encoded by *eat peanuts* – only subevents in which more than one peanut is eaten instantiate this predicate. It follows from (33) that if *all* events in the extension of P are P-atoms, then P must be quantized and thus telic, and given (32), the inverse holds as well. Thus:

(37) $\forall P \subseteq U_E [\mathrm{TEL}_E(P) \leftrightarrow \forall e \in U_E [P(e) \rightarrow \mathrm{ATOM}_E(e,P)]]$

Therefore, if P is atelic (in the sense of divisive), it must have at least one non-atomic event that falls under it:

(38) $\forall P \subseteq U_E [\mathrm{ATEL}_E(P) \leftrightarrow \exists e \in U_E [P(e) \wedge \neg \mathrm{ATOM}_E(e,P)]]$

We show in §3.3 that homogeneously divisive predicates entail realization with respect to any topic time that overlaps with the run time of an event in their denotation. With regard to atomic predicates, we argue that realization is indeterminate, since it is impossible to know whether the run times of any P-atoms overlap with topic time. It is not clear to us whether there are any predicates in natural languages that apply to events composed out of combinations of homogeneously divisive and atomic parts; but if there are, the indeterminacy argumentation carries over to them, since there is no way of knowing whether topic time falls in a homogeneously divisive part or not. The same goes for cases such as *walk*, where we have a relatively clear

intuition that the predicate must be somehow atomic, but we do not find it easy to delimit the atomic subevents.

3.2 EVENT REALIZATION AND TOPIC TIME

'Realization' of an event amounts to what is meant in ordinary English by saying that an event *occurs* or *happens*.[24] We take realization to be the "eventish" equivalent of the existence of individuals. However, we cannot hope to model realization simply by existential quantification over an event variable. 'Event arguments' are often existentially bound by default in Davidsonian frameworks (cf. e.g., (41) below). More importantly, beyond the technicalities of Davidsonian event semantics, existential quantification in predicate calculus seems on the whole ill-suited to the representation of the "contingent" (in particular: time-bound) existence/realization of individuals/events in imagined or experienced reality; and this naturally extends to the encoding of existence/realization in language (see von Stechow (2001) for the argumentation regarding existence).

The account of realization we give here has two components: an "intra-propositional" one, which captures the dependence of realization on the event predicate and the time for which a proposition is evaluated, i.e., the Kleinian 'topic time' of the utterance, and a propositional-level component, which captures the relativity of realization vis-à-vis possible worlds. We

[24] We borrow the term 'event realization' from Pederson (forthcoming) and Talmy (1991).

only provide a formal treatment of the former notion. It is not difficult to see that the notion of event realization, as we envision it here, has a denotation that does not carry over across possible worlds. Thus, future time reference (39a), epistemic modals (39b), belief contexts (39c), and counterfactuals (39d) all constitute opaque contexts for realization, in the sense that they do not license the inferences that the (interlocutor's model of the) actual world in which the utterances are made contains an event of John drawing a circle.

(39) a. John will draw a circle.

b. John may draw a circle.

c. Floyd thought that John drew a circle.

d. If Floyd had shown up, John would have drawn a circle.

Yet, the inference patterns of the Imperfective Paradox go through in these contexts as long as the worlds with respect to which the propositions are evaluated are kept constant:

(40) a. John will be pushing a cart. ∴ John will push a cart.

John will be drawing a circle. not∴ John will draw a circle.

b. John may be pushing a cart. ∴ John may push a cart.

John may be drawing a circle. not∴John may draw a circle.

And so on. So to the extent that we appeal to event realization in our account of these patterns, event realization should be equipped to have the desired effect independently of possible-world semantics. A good starting point is Parsons's (1990) notion of 'culmination'. In Parsons's framework, the semantics of (41a) and (b) may be spelled out as in (41a') and (b'), respectively (cf. Parsons 1990, pp. 170-172):

(41) a. John was drawing a circle.

a'. $\exists t[t<now \wedge \exists e[\text{drawing\_a\_circle}(e) \wedge \text{agent}(\text{John},e) \wedge \text{Hold}(e,t)]]$

b. John drew a circle.

b'. $\exists t[t<now \wedge \exists e[\text{drawing\_a\_circle}(e) \wedge \text{agent}(\text{John},e) \wedge \text{Cul}(e,t)]]$

This accounts for the Imperfective Paradox by treating the circle drawing event in (41a) as 'unculminated'; instead, the predicate Hold, which represents the equivalent of Cul for states, encodes the semantic contribution of the progressive. Since Parsons does not state the truth conditions for either Cul or Hold, it remains unclear what it means for an event to hold instead of culminating (cf. also Landman 1992; Zucchi 1999). Aside from this, a major drawback of Parsons's proposal is the application of Cul directly to events and times, leaving aside the contribution of the event predicate. Accordingly, while the analysis in (41a') captures the

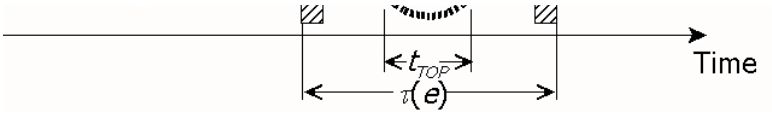
drawing of the circle remaining unculminated, it fails to license the inference that at least part of the event is realized, which might well instantiate the predicate *draw'*, even if it does not instantiate *draw a circle'*. [25]In line with Krifka's mereological approach to event semantics, and in agreement in this respect with Zucchi (1999), we attempt to avoid these problems by relativizing realization not merely to events and times, but also to event predicates; it is thus not events as such that are (un)realized at particular times, but events *under a predicate*.

A final issue concerns the identity of the time variable in (41). Should this be equated with the 'run time' of the event, i.e., the situated time interval defined by beginning and end of the event? In the spirit of Klein (1994), we think not. Klein's analysis of the progressive in (41a) (cf. (29) above) would situate the topic time t_{TOP} with respect to which (41a) is asserted within the run time of the circle drawing event. It is only the part of the event carved out by overlap with t_{TOP} that is asserted to be realized (cf. Figure 1).

[25] To deal with telicity, Parsons is forced into an ontological distinction between events and

processes, the latter being treated as indefinite sequences of culminated event atoms.

Figure 1. *Realization and topic time under Klein's (1994) analysis of imperfectives*



If the predicate the event instantiates is telic, the proper subevent overlapping with topic time cannot itself fall under the predicate; hence, realization under imperfective aspect is excluded with telic predicates. In contrast, if the predicate is atelic, it is at least *not excluded* that the proper subevent selected by the imperfective for overlap with topic time instantiates the predicate .[26] Topic time has this power of constraining event realization because by definition it constrains the time for which propositions about some event are asserted, questioned, etc. The part of such propositions we are concerned with here is the application of an event predicate to the event at the topic time in certain worlds. Imperfective aspect restricts this part of the proposition's "claim" to a topic time within the run time of the event, and thereby excludes realization of the event as a whole from what the propositions make claims about. Whether the proper subevent that falls within topic time, and thus within what the proposition is about, instantiates the predicate, and thus ensures realization, is then largely a matter of the

[26] We argue in §3.3 that event realization with atelic predicates under imperfective aspect is actually strictly speaking indeterminate, except in the – perhaps somewhat unrealistic – case of homogeneously divisive predicates.

telicity of the predicate.[27]

We are now in a position to define event realization "within" a possible world:

(42) $\forall P, t_{TOP}, e \subseteq E[\text{REAL}_E(P, t_{TOP}, e) \leftrightarrow \exists e'[P(e') \wedge e' \leq_E e \wedge \tau(e') \leq_T t_{TOP}]]$

That is, a predicate *P* is realized by event *e* at topic time t_{TOP}, or equivalently, *e* is realized under *P* at t_{TOP}, if and only if at least the run time of a subevent *e'* of *e* that also falls in the denotation of *P* is included in t_{TOP}.

3.3 From event realization to default aspect

We argue that if a language has predicates that are formally zero-marked for aspect, but have telicity-dependent aspectual reference, then these predicates come to be aspectually interpreted under an implicature of event realization. We can thus model this implicated aspectual operator as in (43), and ask what its interpretation will be depending on the telicity of the predicate.

(43) DASP := $\lambda P \lambda t_{TOP} \exists e[\text{REAL}_E(P, t_{TOP}, \text{e})]$

(43) has the format of the aspectual operators in (28)-(29). When applied to

[27] One might ask whether it is sensible to assign run times to unrealized events, as our analysis does, in view of the severe restrictions on combining imperfectives with, e.g., duration specifications (Mittwoch 1988; cf. also Zucchi 1999). In our view, there is no contradiction here. It seems

an event predicate *P* and an event variable *e* bound by existential closure, DASP will assign to t_{TOP} a suitable topic time 'projection range' such that *e* is realized under *P*. Two questions arise now: (a) why should aspectually unmarked predicates come to implicate something like (43)? And (b), assuming that predicates are aspectually interpreted under (43), what values will DASP assign to t_{TOP}, and what relations between t_{TOP} and the run time $\tau(e)$ will this determine?

Regarding (a), we submit that Grice's (1975) second maxim of Quantity (Q2) provides the answer: "Do not make your contribution more informative than is required"; cf. also Levinson's (2000) equivalent 'I-Heuristic', "What is expressed simply is stereotypically exemplified". It certainly seems reasonable to consider aspectual reference under event realization more stereotypical than aspectual reference under lack of realization, and thus leave the latter to overtly marked forms. This assumption is supported by our interpretation of the child language data cited in §4. If reference to realized events is developmentally prior to reference to unrealized events, this can be taken as evidence to the greater stereotypicality of aspect under realization compared to aspect under lack of realization.

Now for (b), the interpretation of DASP depending on the telicity of the predicate. Note first that given (42), (43) requires t_{TOP} and $\tau(e)$ to overlap

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impossible to understand the semantics of imperfectives without reference to proper subevents,

(since at least the run time of a subevent of *e* must be included in t_{TOP}), ruling out prospective and perfect aspect interpretations. Furthermore, if *P* is telic, then it must be the case that $\tau(e) \leq_I t_{TOP}$ (run time included in topic time), i.e., DASP produces a perfective viewpoint according to (28). This is because according to (32), if *P* is telic, no proper subevent of *e* falls under *P*. Thus, the only way for t_{TOP} and $\tau(e)$ to overlap is $\tau(e) \leq_I t_{TOP}$. In other words, telic predicates only have realization under perfective aspect. This explains part of the Imperfective Paradox, namely why *John was drawing a circle* does not entail realization of a circle drawing event at any topic time, and thus does not license *John drew a circle*.

But what if *P* is atelic? First, suppose *P* is homogeneously divisive. Then according to (34), any subevent of *e* will instantiate *P*. This includes an infinite number of proper subevents *e'* such that $\tau(e') <_I t_{TOP}$ (inclusion of the proper subevent in topic time) and yet $P(e')$. Hence, realization of *e* under *P* at t_{TOP} is compatible with $t_{TOP} <_T \tau(e)$ (topic time is a part of the run time interval of *e*), i.e., imperfective viewpoint according to (29). Assuming that *push a cart* encodes a homogeneously divisive event predicate, this explains why *John was pushing a cart* being true at some definite t_{TOP} entails that *John pushed a cart* is true at the same t_{TOP}, i.e., the second half of the Imperfective Paradox. This is because whatever subevent of John's cart pushing is carved out by its run time coinciding with topic time falls under

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which by their very definition imply at least intensionally "larger" events and their run times.

push a cart'.

However, a perfective interpretation of DASP is of course possible with atelic predicates as well – perfectivity *always* gives realization ($\tau(e) \leq_I t_{TOP}$ as in (28) makes $\tau(e') \leq_I t_{TOP}$ in (42) trivially true for $e'=e$.) So truth-conditionally, the interpretation of DASP with homogeneously divisive predicates is vague regarding perfectivity. But in this case, all else being equal, a scalar implicature licensed by Grice's (1975) first maxim of Quantity (Q1, "Make your contribution as informative as is required", or Levinson's (2000) equivalent 'Q-heuristic' ("What isn't said, isn't")) will assign an imperfective reading to DASP due to the absence of perfective marking.[28] Imperfective and perfective aspects form an entailment scale (or 'Horn scale', after Horn (1972)) regarding event realization. Consider (44):

(44) $\forall P,t_{TOP},e,e' \subseteq E[e' \leq_E e \rightarrow [[\text{IMPF}(P,t_{TOP},e) \wedge \text{REAL}_E(P,t_{TOP},e')]$
$\rightarrow [\text{PRV}(P,t_{TOP},e) \rightarrow \text{REAL}_E(P,t_{TOP},e')]]]$

That is, any subevent of e that realizes P under imperfective aspect will also realize P under perfective aspect. The inverse, however, does not hold. Consider again Figure 1. In the imperfective, because of $\tau(e) \leq_I t_{TOP}$, there may be marginal subevents of e the run times of which do not overlap with t_{TOP} (the hatched parts of e in Figure 1). Suppose such a marginal subevent

[28] We are indebted to Manfred Krifka for this obsservation .

e' happens to fall under *P* – as it must if *P* is homogeneously divisive. *e'* would be realized under perfective aspect in this case (its run time falling inside topic time), but not under imperfective aspect (its run time falling outside topic time).

There is a more general way of looking at this problem, which we introduce here since we will need it below when talking about atomic predicates. Even if the marginal subevent *e'* does not itself fall under *P*, it would still be realized *as part of* the larger *e* under perfective aspect. This idea is not too hard to formalize, since being realized as part of a larger event is simply being a part of a larger event that is realized:

(45) $\forall P,t_{TOP},e' \subseteq E[\text{PREAL}_E(P,t_{TOP},e') \leftrightarrow \exists e \in U_E[e' \leq_E e \wedge \text{REAL}_E(P,t_{TOP},e)]]$

(46) $\forall P,t_{TOP},e,e' \subseteq E[e' \leq_E e \rightarrow [[\text{IMPF}(P,t_{TOP},e) \wedge \text{PREAL}_E(P,t_{TOP},e')] \rightarrow [\text{PRV}(P,t_{TOP},e) \rightarrow \text{PREAL}_E(P,t_{TOP},e')]]]$

(46) says that any subevent that is p-realized (i.e., 'realized as a part') under imperfective aspect is also p-realized under perfective aspect. It is easy to show that the inverse of (46) does not hold, regardless of the telicity of the predicate. Any subevents included in the hatched parts of *e* in Figure 1 will be p-realized under perfective, but not under imperfective aspect.

So in terms of subevent realization, perfective aspect is stronger and more informative than imperfective aspect. In line with this, absence of perfective marking in a context where perfective might have been marked Q1-implicates an imperfective interpretation. More specifically, subevents that would be entailed to be (p-)realized under perfective aspect, but not under imperfective aspect, will be assumed to be unrealized under lack of perfective marking, which amounts to imperfective reference to *e* under *P* (see Levinson 2000 for further discussion of scalar implicatures).

Now let us turn to atomic atelic predicates, such as those encoded by *sneeze* or *eat peanuts*. Consider Figure 2.

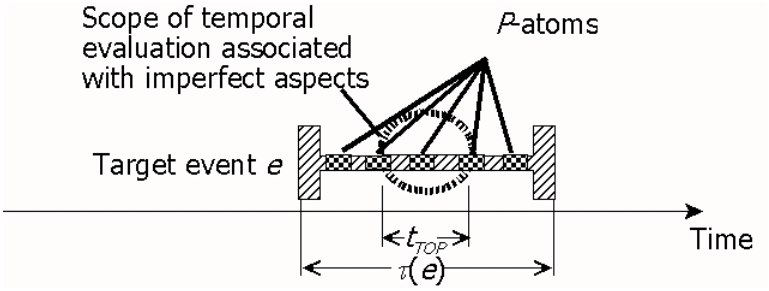

Figure 2. *Realization under imperfective aspect with atomic predicates*

In order for a subevent *e'* of *e* to realize an atomic atelic *P* under imperfective aspect, *e'* has to be (part of) a *P*-atom the run time of which falls into topic time. How do we know when this is the case? We think that the best answer to this question might be that strictly speaking, we never do. Because to come up with anything more than a conjecture, we would need to know the values of both t_{TOP} and the run times $\tau(e')$ (or at least the

duration) of all candidate *P*-atoms. But as Klein (1992) argues, it is pragmatically strange to have definitely specified both a topic time and the run time of an event related to the topic time by some aspect operator. And as Mittwoch (1988) and Zucchi (1999) argue, to specify the duration of an event is strange, at best, under imperfective aspect anyway. For these and other reasons, it seems impossible to know whether, e.g., (47) licenses (48):

(47) Friederike was eating peanuts when a monkey snatched the bag.

(48) Friederike ate peanuts.

This, one might object, cannot be right – (47) does seem to entail (48). We agree; but we think that the entailment goes through for a different reason. Other than under a 'futurate' (or 'prospective') reading (which seems impossible in (47)), the truth conditions of the progressive in (47) require Friederike at topic time to already have started eating peanuts (although this admittedly does not follow from the Kleinian definition of the imperfective viewpoint in (29)). Thus, a world in which (47) is true must have recorded a history that includes an earlier time at which an initial peanut eating subevent was realized. But this is in more than one respect outside the scope of our present concerns. All that matters here is that there is no way of making sure that there is *one and the same topic time* with respect to which both (47) and (48) can be truthfully asserted. In this sense, we argue, event

realization is indeterminate with atelic atomic predicates under imperfective aspect.

This, however, does not affect the validity of (46) and the event realization Horn scale. If a given subevent *e'* is p-realized in the imperfective, it is also p-realized in the perfective, while the opposite does not necessarily hold. And since indeterminacy of realization does not mean that DASP with atelic atomic predicates is incompatible with an imperfective interpretation, absence of perfective marking will still trigger a Q1-implicature to imperfective aspect, as long as an imperfective interpretation is not blocked, as it is in the case of telic predicates (perfective and imperfective are the only possible interpretations of DASP).

As we have argued in §3.2, all atelic predicates are either homogeneously divisive, or atomic, or their behavior regarding realization can be viewed as falling between that of atomic and homogeneously divisive predicates. To summarize, if an aspectually unmarked predicate Q2-implicates event realization, and is assigned aspectual reference accordingly, then if that predicate is telic, it must have perfective aspectual reference. If the predicate is homogeneously divisive, it will have event realization under both perfective and imperfective aspect. In this case, since imperfective and perfective aspect form a Horn scale in terms of subevent realization, absence of perfective marking will trigger a Q1-implicature to imperfective interpretation. And if the predicate is atelic, but has atomic subevents, then

realization at topic time is indeterminate, and since the predicate is still compatible with both perfective and imperfective readings, Q1 will again select the latter.

In the next section, we revisit the phenomena introduced in §2, to see how aspectual reference under event realization can account for them.

3.4 Event Realization and the Crosslinguistic Phenomena

In this section, we address the role of default-aspectual interpretations on the basis of event realization in telicity-dependent aspectual reference as described in §2.

Probably the simplest case of telicity-dependent aspect is that of Standard German, a language that lacks overt aspect marking altogether. Wherever contextually admissible, event descriptions in such a language will Q2-implicate event realization. Given the dependence of realization conditions on telicity, telic predicates come to be associated with perfective viewpoints, while clauses encoding atelic predicates Q1-implicate imperfective viewpoints.

The case of Inuktitut differs from that of German merely in that overtly expressed aspect operators pick up the combinations that fall outside default alignment, i.e., imperfective with telic predicates and perfective with atelic predicates. The same holds for the marked imperfective aspect in *–iv*/*-yv* of Russian prefixed telic verbs. In both Inuktitut and Russian, the existence of

marked contrasting forms appears to have had the effect of triggering 'pragmatic strengthening' of the implicated meanings associated with the zero-marked constructions, apparently to the point of turning them into entailments. Clauses encoding atelic predicates may have both imperfective and perfective interpretations in Russian. This is in fact predicted by our account – atelic predicates are compatible with realization under both imperfective and perfective aspect! Whether and under what conditions zero-marked clauses with atelic predicates Q1-implicate imperfectivity, as they do in German, remains to be ascertained.

4. Further Implications: Child Language

In this section we examine evidence from first language acquisition suggesting that event realization also plays a crucial role in the development of temporal reference in early child language crosslinguistically.

Across a number of typologically diverse languages, children's early utterances show an initial bias in time-locational and aspectual reference based on verb semantics. Specifically, children use telic predicates predominantly or only with perfective aspect and past time reference, and atelic predicates predominantly or only with imperfective aspect and present time reference. An early influential study by Bronckart and Sinclair (1973) found that young French children typically referred to events with clear results with the *passé composé*, but they used the *présent* for events with no

clear result. Antinucci and Miller (1976) reported comparable findings for Italian: children used the *passato prossimo* for telic event descriptions with clear results, but they never used past marking with atelic event descriptions. Several studies on English acquisition have shown that young children first use *-ed* and irregular past forms in reference to completed events, typically with clearly discernible result states, as in *The milk spilled* and *It broke*, while they use progressive *-ing* primarily in reference to ongoing activities, such as *She is swimming* (e.g., Bloom, Lifter and Hafitz 1980; Shirai and Anderson 1995; Clark 1996). Similar patterns of restricted temporal reference in early child language have also been reported for a number of non-Indo-European, including Inuktitut (Swift forthcoming).

In the interpretation of these findings, several researchers have invoked Piaget's (1969) influential view, which maintains that cognitive concepts are prerequisites for linguistic development, and children in their early stages of development are 'egocentric', live in the 'here-and-now', and do not refer to events outside of their immediate experiential environment until they have the ability to 'decenter', i.e., abstract away from their own experience. For example, Antinucci and Miller explain children's restricted distribution of verb forms with the idea that observable results provide a "concrete link" between a past event and a current state from which a young child could construct a representation of the past event, and the lack of such results explains the absence of past forms with atelic event descriptions.

Alternatively, Slobin (1985) has argued that children have semantic predispositions for two basic temporal categories: process (ongoing, dynamic) and result (punctual, completed).

We propose a different yet compatible explanation for young children's restricted distributions of verb forms, based on the dependence of realization conditions on telicity in combination with Piaget's early developmental restriction to the "here-and-now". On our analysis, children's initial utterances show a preference for aspectual reference under event realization.

Atelic event predicates are compatible with realization under both imperfective and perfective aspect, imperfective aspect and present time reference is preferred since it requires no shift away from the "here-and-now" of coding time, as perfective aspect normally does. Since perfective aspect is required for the realization of telic predicates, however, past time reference may be licensed by result states that link past events to coding time, as suggested by Antinucci and Miller (1976).[29]

Children use whatever forms are appropriate in the language they are acquiring to talk about realized events. In English, these are the simple past form for perfective aspect and the *-ing* form for imperfective aspect. In

[29] On our account, future time reference is excluded both by the constraint to event realization and the one against disalignment between topic time and coding time. This is, however, not to say that children do not express needs, fears, and desires – but these are conceptualized and encoded as

Inuktitut, however, event realization plays a special role. As shown in §2, a single zero-marked verb form is used to express both imperfective aspect with atelic predicates and perfective aspect with telic predicates. So while it may be argued that children acquiring English actually interpret the *-ing* form as an imperfective marker and the *-ed* form as a perfective marker, the structure of Inuktitut offers no basis for such an analysis. However, the Inuktitut acquisition data show that children come to terms with this temporal variation within a single construction at an early age. Our analysis gives a uniform meaning to the Inuktitut zero-marked form, namely reference to realized events, and on our account, that is exactly what children acquiring Inuktitut take it to be. More generally, if young children in early stages of development only talk about their experienced reality, then they only talk about realized events. On this analysis, children's early time reference is not governed by a dichotomy between processes and results, but by the single category of event realization.

5. CONCLUSION

We have argued that the property of event realization – the "eventish" equivalent of the existence of individuals – plays a powerful role in natural language semantics. Event realization mediates the interactions between

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experiential states that hold at coding time.

aspectual viewpoints and telicity known as the Imperfective Paradox. On the basis of these interactions, Gricean generalized conversational implicatures assign telicity-dependent viewpoints to clauses and verbal projections not overtly marked for aspect in languages with aspect systems as diverse as those of German, Inuktitut, and Russian. Moreover, we suggest that event realization constrains aspectual reference in early child language such that reference to realized events developmentally precedes reference to unrealized events, indicating a strong cognitive basis for event realization as manifest in language use from an early age.[30]

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